ABSTRACT OF THE DISCLOSURE

Methods and systems for generic optimization of problems by an approach to

5   minimizing functions over high-dimensional domains that mathematically model problems for which near optimal or optimal solutions are sought. These embodiments receive a mathematical description of a system, in symbolic form, that includes decision variables of various types, including real-number-valued, integer-valued, and Boolean-valued decision variables, and accompanied by a variety of constraints on the values of the decision variables,

10   including inequality and equality constraints. The objective function and constraints are incorporated into a global objective function. The global objective function and a procedure for finding critical points are transformed into a system of differential equations in terms of continuous variables and parameters, so that powerful, polynomial-time methods for solving differential equations can be applied for identifying critical points of the function.

15   Embodiments of the present invention also provides for distribution and decomposition of the global gradient descent-field and local gradient descent-field optimization methods using multiple threads and agents, respectively, in order to allow for parallel computation and increased time efficiency. Various embodiments of the present invention further include approaches for adjusting solutions to optimization problems relatively continuously in time,

20   without needing to recompute the optimization solution *de novo*. While many embodiments of the present invention are specifically directed to various classes of optimization problems, other embodiments of the present invention provide a more general approach for constructing complex hierarchical computational processes and for optimally or near optimally controlling general computational processes.